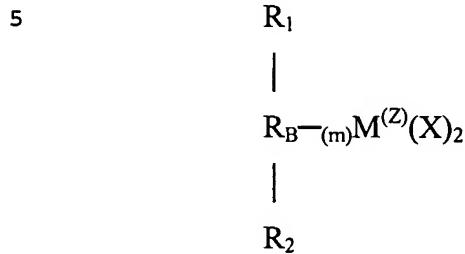


I CLAIM:

1. A bridged compound having the formula:



- 10 wherein M is a metal; each X is an atom or group covalently or ionically bonded to M and may be the same or different; R₁ and R₂ may be the same or each may be different and are substituted or unsubstituted cyclopentadienyl or aromatic rings; R_B is a structural bridge between the cylcoperpentadienyl or aromatic rings R₁ and R₂ and imparts stereorrigidity to the rings, and comprises at least one heteroatom bonded to M, with each of R₁ and R₂ bonded to the same or different heteroatom of R_B; Z is the coordination number of M and is greater than or equal to 4; m is the number of bonds between M and heteroatoms of R_B and to impart sterorrigidity m≥2; and with R₁, R₂ and R_B selected to provide a catalyst component with C₁, C₂ or C_S symmetry.
- 15 2 The compound of claim 1, wherein M is selected from the group consisting of transition metals and lanthanide metals, wherein the heteroatoms are selected from the group consisting of O, N, S, and P.
- 20 3 The compound of claim 1, wherein R_B comprises at least three heteroatoms, and wherein R₁ is bonded to one of the heteroatoms, and R₂ is bonded to a different one of the heteroatoms.

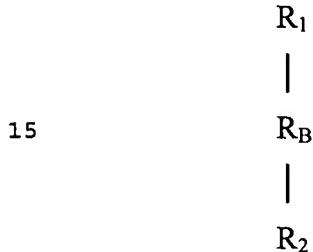
4 The compound of claim 1, wherein M is selected from among Fe, Co and Ni.

5 The compound of claim 1, wherein M is Fe, R_B comprises three heteroatoms bonded to M, and wherein R₁ is bonded to one of the three heteroatoms, and R₂ is
5 bonded to a heteroatom different than the heteroatom to which R₁ is bonded; M is selected from among Fe, Co and Ni.

6 The compound of claim 5, wherein each X is independently selected from among halides and substituted or unsubstituted hydrocarbons.

10

7 A method of making a bridged compound comprising contacting a metal compound of the formula M(X)₂ with a bridged compound R_B of the formula



wherein M is a metal; each X is an atom or group covalently or ionically bonded to M and may be the same or different; R₁ and R₂ may be the same or each may be
20 different and are substituted or unsubstituted cyclopentadienyl or aromatic rings; R_B is a structural bridge between the cylcopentadienyl or aromatic rings R₁ and R₂ and imparts stereorrigidity to the rings, and comprises at least one heteroatom suitable for bonding to M, with each of R₁ and R₂ bonded to the same or different heteroatom of R_B; and with R₁, R₂ and R_B selected to provide a bridged metallocene compound
25 with C₁, C₂ or C_S symmetry.

8 The method of claim 7, wherein M is selected from the group consisting of transition metals and lanthanide metals, wherein the heteroatoms are selected from the group consisting of O, N, S, and P.

5 9 The method of claim 7, wherein R_B comprises three heteroatoms, and wherein R₁ is bonded to one of the three heteroatoms, and R₂ is bonded to a different one of the three heteroatoms.

10 The method of claim 7, wherein M is selected from among Fe, Co and Ni.

10

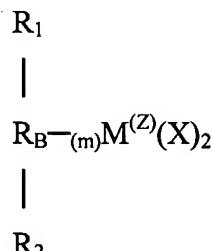
11 The method of claim 7, wherein M is Fe, R_B comprises at least three heteroatoms, and wherein R₁ is bonded to one of the three heteroatoms, and R₂ is bonded to a heteroatom different than the heteroatom to which R₁ is bonded; M is selected from among Fe, Co and Ni.

15

12 The method of claim 11, wherein each X is independently selected from among halides and substituted or unsubstituted hydrocarbons.

20

13 A catalyst system comprising an activated bridged compound having the formula:



25

wherein M is a metal; each X is an atom or group covalently or ionically bonded to M and may be the same or different; R₁ and R₂ may be the same or each may be different and are substituted or unsubstituted cyclopentadienyl or aromatic rings; R_B

is a structural bridge between the cyclopentadienyl or aromatic rings R_1 and R_2 and imparts stereorigidity to the rings, and comprises at least one heteroatom bonded to M, with each of R_1 and R_2 bonded to the same or different heteroatom of R_B which heteroatom is also bonded to M; Z is the coordination number of M and is greater than or equal to 4; m is the number of bonds between M and heteroatoms of R_B and to impart stereorigidity $m \geq 2$; and with R_1 , R_2 and R_B selected to provide a catalyst component with C_1 , C_2 or C_S symmetry.

14 The system of claim 13, wherein M is selected from the group consisting of transition metals and lanthanide metals, wherein the heteroatoms are selected from the group consisting of O, N, S and P.

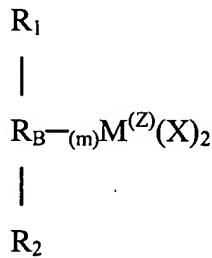
15 The system of claim 13, wherein R_B comprises at least three heteroatoms bonded to M, and wherein R_1 is bonded to one of the heteroatoms, and R_2 is bonded to a different one of the heteroatoms.

16 The system of claim 13, wherein M is selected from among Fe, Co and Ni.

17 The system of claim 13, wherein M is Fe, R_B comprises three heteroatoms bonded to M, and wherein R_1 is bonded to one of the three heteroatoms, and R_2 is bonded to a heteroatom different than the heteroatom to which R_1 is bonded; M is selected from among Fe, Co and Ni.

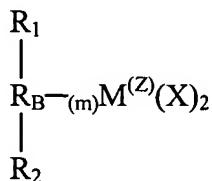
18 The system of claim 17, wherein each X is independently selected from among halides and substituted or unsubstituted hydrocarbons.

19 A method of making a catalyst system comprising contacting an activator with a bridged compound having the formula:



wherein M is a metal; each X is an atom or group covalently or ionically bonded to M and may be the same or different; R₁ and R₂ may be the same or each may be different and are substituted or unsubstituted cyclopentadienyl or aromatic rings; R_B is a structural bridge between the cyclopentadienyl or aromatic rings R₁ and R₂ and imparts stereorrigidity to the rings, and comprises at least one heteroatom bonded to M, with each of R₁ and R₂ bonded to the same or different heteroatom of R_B which heteroatom is also bonded to M; Z is the coordination number of M and is greater than or equal to 4; m is the number of bonds between M and heteroatoms of R_B and to impart stereorrigidity m≥2; and with R₁, R₂ and R_B selected to provide a catalyst component with C₁, C₂ or C_S symmetry.

20 A method of forming polyolefins comprising contacting olefin monomer or mixture of monomers in the presence of an activated bridged compound having the formula:



wherein M is a metal; each X is an atom or group covalently or ionically bonded to M and may be the same or different; R₁ and R₂ may be the same or each may be different and are substituted or unsubstituted cyclopentadienyl or aromatic rings; R_B

is a structural bridge between the cyclopentadienyl or aromatic rings R₁ and R₂ and imparts stereorrigidity to the rings, and comprises at least one heteroatom bonded to M, with each of R₁ and R₂ bonded to the same or different heteroatom of R_B which heteroatom is also bonded to M; Z is the coordination number of M and is greater than or equal to 4; m is the number of bonds between M and heteroatoms of R_B and to impart sterorrigidity m≥2; and with R₁, R₂ and R_B selected to provide a catalyst component with C₁, C₂ or C_S symmetry.